The

Gardens' Bulletin

STRAITS SETTLEMENTS,

into which is incorporated all that has been published as the third series of the Agricultural Bulletin of the Straits and Federated Malay States.

Vol. I. Issued June 20th, 1914. No. 7.

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To be purchased at the Botanic Gardens, Singapore from Messrs. Kelly and Walsh, Ltd., No. 32 Raffles Place and 194 Orchard Road; and the Straits Times Office, Cecil Street, Singapore.

DEPARTMENTAL NOTICE.

A few plants of the Avocado or Alligator Pear—*Persea gratissima,* and a few plants of the Brazil nut—*Bertholletia excelsa*—to be sold within the Peninsula at fifty cents each.

Seeds of *Hevea brasiliensis*—Para Rubber—as available from little tapped trees, twenty-eight years old, to be sold at fifty cents per hundred.

THE

GARDENS' BULLETIN,

STRAITS SETTLEMENTS.

INTO WHICH IS INCORPORATED ALL THAT HAS BEEN PUBLISHED AS THE THIRD SERIES OF THE AGRICULTURAL BULLETIN OF THE STRAITS AND FEDERATED MALAY STATES.

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THE SIRANGOON OUTBREAK (1913) OF BRACHARTONA CATOXANTHA.

About the middle of the year, 1913, a few moths of *Brachartona catoxantha*—the coconut pest—(vide Agricultural Bulletin, Straits and F.M.S., viii, 1909, page 357, and Bulletin, Department of Agriculture, F.M.S, No. 4) were observed near Singapore town; but no outbreak followed their appearance at that place; instead a severe outbreak followed in the coconut plantations about the head of the Sirangoon river. The centre in the early part of the outbreak was near the Mission church at Sirangoon, and in the small Chinese holdings between it and the Trafalgar Estate; the Trafalgar Estate was rather badly attacked, and also coconut palms about duck farms between the Ponggul Road and the river; while towards Singapore town the caterpillars were to be found sporadically for three miles. They occurred in addition on the leaves of a species of *Calamus* and on those of the *Areca* palm among the coconut palms in the badly affected area.

A generation of moths was found to be emerging from the pupae on November 1st; and several hundred pupae were collected in order to ascertain the degree of parasitisation, as well as the nature of the parasites. The degree was found to be only 4 per cent. and the parasites were in the first place a Tachinid fly, and in the second a Brachonid ichneumon.

As it was evident that these were far from getting the attack under, preparations were made for trying to confine the moth to the area it occupied and for seeking the co-operation of coconut palm owners in the extermination of the pupae. A circular was printed in

Malay, Tamil, and Chinese explaining the nature of the attack, and asking those with attacked trees to burn the lower leaves on which the caterpillars in large quantities had pupated, i.e., the already destroyed leaves. This circular was distributed as soon as an inspector had been appointed for the purpose.

During the month of December, it became evident that the centre of the attack was moving south under the prevailing wind and had got to the junction of the Tampinis Road with the Sirangoon Road. Very sparingly the moth had reached Tanjong Ponggul northwards against the wind.

Spraying meanwhile had been resorted to on the Trafalgar Estate and had done good, for the young trees were free; but the machine was not powerful enough for the spraying of tall palms.

At this stage Nature came to the rescue in the form of a fungus allied to that which causes Muscardine in silk worms—a fungus, new to science which will be described by Mr. G. E. Massee of the Royal Botanic Gardens, Kew, as *Botrytis necans*.

It was first detected near the edge of the Bukit Sembawang Rubber Estate, on the Tampinis Road; and no sooner was it found than it was seized on as a weapon against the moth. The special inspector, having been made familiar with the insect in all its stages and with the fungus, was set to the work of distributing the latter to any colony of caterpillars that he could find free from it. This distribution was done by taking strips of coconut leaves with dead caterpillars or pupae on them, and tying them to the leaves of trees where healthy caterpillars were feeding. Fortunately the caterpillar pupates blatantly in a silken hammock under the leaf that it has been eating, and, if fungus-infected, generally dies inside the hammock, the spores coming to the outside in the form of flour; the fungus is therefore easily found and there was no difficulty in collecting supplies as required.

The inspector, thus working, for instance, spread the fungus through the coconunts about Ponggul, on January 15th, among a brood then maturing which soon pupated and whereof, the Tachinids and Brachonids had but infected 5 per cent. In the next brood the attack was killed out. About Gelong which the moth succeeded in invading, the fungus was also spread; but there is reason to believe that south of the centre the wind did more by distributing the fungus spores that the inspector could have done In February, the outbreak was over.

It is memorable for revealing a means of which we were not aware of possible utility for meeting another attack.

I. H. BURKILL.

CALOGRAMMA FESTIVA, Donovan,—

a Caterpillar destructive to Crinum asiaticum.

In Singapore, the caterpillars of *Calogramma festiva* (a moth), destroy the foliage of *Crinum asiaticum* completely. They live socially, devouring all the green parts of the plant, filling the angles between the leaves and elsewhere with their dejecta, where a mass of putridity arises, among which they may pupate. The putridity is due to the wet dejecta harbouring, in the climate of Singapore, fungi which attack and rot the leaf tissues below, in such a way as to cut off the upper part of the leaf from the bulb; and then the whole blade dies.

The eggs are laid in patches on the plant, covered with a buff felt from the mother moth's body. They are prettily ribbed to the apex. The caterpillars on hatching have a transparent skin with small black bristles arising from swollen bases; and after eating green tissue they look green. They feed by eating the surface of the plant, but seem at a great disadvantage if placed on an old leaf. When three days old, a transverse saddle mark appears behind the head and another on the back before the prolegs, while three faint longitudinal milky white lines become apparent. A day later, dark plum-coloured pigment appears elsewhere in the skin, and also fine milky white lines become apparent between the other lines; when five days old they are already half an inch long, and yellow pigment begins to appear in the dorsal line.

The caterpillars grow to a length of 1½ inches. They appear when full grown to have no hair at all, but in reality have the same kind of scattered small bristles which are present on emergence from the egg. They may be described then as follows:—The skin is black with a narrow median orange brown line down the back, and a nearly even white line down each side half way between the middle of the back and the spiracles. Irregular fine white lines ramify rather sparingly on either side of the straight white line, and every white line is interrupted (but not the orange line) in the segment between the legs and the prolegs, and less definitely on the last segment. Underneath the caterpillars are of a rich brown, and the head is of the same colour.

At maturity the caterpillar has a way when disturbed of raising the fore part of its body and of moving it by jerks.

The life cycle has been observed to occupy seventy five days, so that four broods occur easily within one year.

The moth, which was identified by Dr. R. Hanitsch, is figured in Moore's Lepidoptera of Ceylon, iii, plate 146, fig. 6, and described on page 21 of the text.

I. H. BURKILL.

THE BIG RUBBER TREE, SINGAPORE.

With the first number of the second volume of the "Agricultural Bulletin of the Straits and the Federated Malay States," 1903, a plate was published showing on the right, most of the oldest rubber trees of the Botanic Gardens, Singapore. Those which can be seen, counting from the extreme right, are numbers 1, 2, 3, 4, 5, 7, and 9 of the Gardens' trees: No. 6 and 8 stand a little back, and are not recognisable in the plate. The dimensions of the boles of these trees in the end of 1902, are given on page 1.

Death has spread down the line from No. 5, which was blown over and died in 1905. Between 1905 and 1909 No. 4 died. In 1910 No. 3 died. And now the largest of all, No. 2 is dead. *Fomes semitostus* seems to have been the cause of the trouble; but none of its fructifications have appeared.

The trees were received as seedlings in Singapore in the year 1877, and were planted out in their present place soon after their arrival. They began to seed in 1881. It seems (Bulletin, ix, 1910, page 213) that some of the trees were tapped as early as 1889. It is recorded (Bulletin, ii, 1903, page 112) that between 1893 and 1902, they were very heavily tapped on various occasions; but it is probable that we should not now call the tapping which they had heavy. Tree No. 2, was tapped again as follows:—

18 times between March 26th and May 2nd, and, May 20th and June 6th, 1903.

17 times between January 23rd and February 28th, 1905, by herring bones as a member of a group of trees called "Experiment VII."

73 times between January 22nd and June 1st, 1906, by spirals, yielding 14 lbs. 7½ ozs. of dry rubber and 1 lb. 8 ozs. of scrap.

24 times between November 2nd and November 28th, 1906, by spirals; but the weight of the rubber is not recorded.

26 times between January 7th and February 6th, 1909, by spirals, yielding more or less 8 lbs. 7 ozs. of dry rubber.

54 times between September 6th and October 4th, and, between November 11th and December 6th, 1909, by spirals, yielding 14 lbs. 3½ ozs. of dry rubber.

37 times between January 2nd and February 12th, 1913, by spirals, yielding 11 lbs. of dry rubber.

29 times between December 18th, 1913 and January 30th, 1914, by spirals, yielding 7 lbs. of dry rubber in sheets, 1 lb. of clot and 2 lbs. of scrap.

The tree, however, has never been tested as a rubber yielder, being wanted for seed-producing, and always since 1903 tapped lightly.

Its latex seemed to clot more readily in later years than in the earlier.

It is extremely probable that it was tapped between 1906 and 1909, but records have not been found.

A plate in the Agricultural Bulletin, Vol. vii. 1908, issued with the July number, shows the first spiral tapping of the tree and the old herring bone scars. Another illustration of it from a photograph taken a little later by Mr. H. Overbeck, occurs in Mr. E. Mathieu's "Para Rubber Cultivation," 1909, page 125.

Successive measurements of the bole of the tree at three feet from the ground have been recorded as follows:—

1904, 6th May	... ...	9 feet	1½ inches.
1905, 8th May	... ...	9 „	3¾ „
1906, 8th May	... ...	9 „	5¾ „
1909, 5th May	...	10 „	½ inch.
1910, presumedly in May	...	10 „	1½ inches.
1911, 4th July	... ...	10 „	3 „
1913, 7th May	... ...	10 „	5¼ „
1914, 8th May at removal after death	...	10 „	5 „

These figures indicate that its increase of growth during the last five years has been at the rate of one inch in circumference per annum, and that for the five preceeding years it was at the rate of about two inches per annum.

When uprooted it was found to be 105 feet in height, which is not unusual; but as regards its girth we must count it an abnormality.

I. H. B.

SEVENTEEN YEARS OF TAPPING IN THE WATERFALL GARDENS, PENANG.

In the Waterfall Gardens, Penang, there is a Para Rubber tree, now 28 years old which has been tapped yearly since 1896, a record being kept of its individual yield. A history of it is given on page 385 of volume I, 1901-02, of the Agricultural Bulletin of the Straits and Federated Malay States, together with a plate. As the

experiment is now being discontinued, to record the results is desirable. The weight of dry rubber each year has been as follows :—

	lbs.	*oz.*
1896	Not recorded.	
1897	1	0
1898	3	0
1899	5	12
1900	3	12
1901	2	2⅜
1902	2	13¼
1903	3	6
1904	3	14
1905	4	12¼
1906	4	4½
1907	2	0
1908	3	8
1909	8	4
1910	10	0
1911	13	0
1912	13	8
1913	13	0
Total ...	98	0⅜

MOHAMED HANIFF.

SELECTION OF RUBBER SEED.

The following is from the Bulletin de l'Association des Planteurs de Caoutchouc, v, 1913, page 305.

"Mr. W. T. Ruys, manager of the Plantation of the Company Rotterdam Tapanoelie, has made a very interesting experiment in selecting seeds of *Hevea*, the result of which the Company has been so good as to communicate to us. Mr. Ruys took 96 seeds in order to ascertain the influence of size on their germinative power and growth, and divided them into four groups, each of 24 seeds, by their size, which were weighed collectively. The seeds were sown on January 22nd, and the seedlings measured on the 11th of June, following, with these results :—

No. of Seeds.	Weight of same in grammes.	No. which germinated.	Stems produced collectively measured in cm.	Average length in cm.	No. of plants of different heights.								
					90 cm.	80 cm.	70 cm.	60 cm.	50 cm.	40 cm.	30 cm.	20 cm.	Less than 20 cm.
24	141.5	20	1271	65.5	1	1	5	4	5	4	–	–	–
24	116.5	18	997	55.5	–	–	4	4	4	4	1	1	–
24	86.5	13	545	42.0	–	–	1	2	1	2	5	1	1
24	42.5	4	96	24.0	–	–	–	–	–	1	–	2	1

The conclusion is that large seeds furnish by far the best results, both as regards germination and as regards growth of the seedlings. One should therefore, before planting seeds, go over them and selecting from them, count as inferior and throw out all which weigh less than five grammes."

THE POSITIONS OF THE AGRICULTURAL INDUSTRIES IN THE STRAITS SETTLEMENTS IN 1913.

In arranging the following statements, the first place is given to the territory of Malacca, because in it Para Rubber—the premier crop of the Malay Peninsula—is more developed than elsewhere.

Territory of Malacca.

If we compare the rubber produced and exported from Malacca with that produced and exported from the whole peninsula, we get the following figures :—

Date.	*Export of the Peninsula.*	*Crop of Malacca.*	*Percentage of the whole which the crop of Malacca makes.*
1911	23,615,417 lbs.	2,180,788 lbs.	9.23
1912	43,102,314 „	5,527,040 „	12.82
1913	77,836,945 „	9,342,997 „	12.00

Having interest to this considerable extent, the Malacca planters during 1913 made themselves leaders in dealing with the important question of wages, and with marked success. Such interest and such success fully justify in themselves the arrangement of material adopted here.

It was in 1898 that Mr. Tan Chay Yan planted 40 acres with Para rubber, mixed with *Ficus elastica*, on Bukit Lintang, near Malacca town, and then formed a Chinese syndicate to plant up more Para rubber (mixed with tapioca) on Bukit Asahan towards the north east corner of Malacca territory, becoming the first outside Negri Sembilan and the second in the whole peninsula to take up an industry which the Government had been putting forward as a possibility for some years. The Government of the Straits Settlements had at that time trees at Singapore, Penang, and near Malacca; the Government of Perak had trees at Kuala Kangsar and near Teluk Anson; and Mr. T. Hislop Hills—the first planter—had trees on his estate at Sungei Ujong. Other trees had been distributed and planted in District Officers' gardens but their history has yet to be collected.

From 1897 the extension of the planting in Malacca was as follows:—

1897	about 3 acres,	all Government trees.
1898	23 „ ,	twenty (or half of forty) belonging to Mr. Tan Chay Yan.
1899	233 „ ,	thirty-two belonging to Government.
1900	788 „	
1901	?	
1902	?	area returned together with that of gambier, etc.
1903	?	
1904	5,515 acres,	including some *Ficus elastica.*
1905	12,866 „	
1906	34,199 „	
1907	47,870 „	
1908	61,781 „	
1909	? „	
1910	72,530 „	
1911	80,424 „	
1912	95,440 „	
1913	117,200 „	

Of these 117,200 acres, 65,818 are in the hands of 40 considerable companies, and the rest, amounting to 51,382 is in private hands, being very largely in quite small blocks.

In computing these figures of acreage, catch crops have been taken into consideration; thus, an area planted with tapioca under rubber or an area planted with gambier under rubber, is credited between the two crops in the making up of the total, but as the catch crop is cut out, the whole is credited to the permanent crop, i.e., rubber. Therefore an increase of area may be due to two causes, either to actual planting of rubber trees or to the removal of a catch crop under them, and the great extension of the area under rubber in 1913 is due mainly to this removal of catch crops and not to new plantings, which account for but a tithe. On the figures, 6.7 per cent. of the whole present area is the increase of 1911, and 12.8 per cent. the increase of 1912, but 18.6 per cent. is the increase of 1913. Malacca's stake in the industry is represented by the figures; but what the stake really is, may perhaps be better put in the following table.

Area of the Territory of Malacca—461,120 acres.—

Year.	*Percentage uncultivated.*	*Percentage in rubber.*	*Percentage in other crops.*
1904	67.47	1.20	31.33
1905	66.86	2.79	30.35
1906	65.47	7.42	27.11
1907	64.27	10.38	24.35
1908	64.00	13.39	22.61
1909	62.50	14.00 ?	25.50
1910	54.12	15.73	30.15
1911	47.81	17.44	34.75
1912	47.81	20.70	31.49
1913	43.32	25.42	29.26

They are satisfactory figures in that they leave the conclusion patent that rubber has led to an extension of cultivation instead of making room for itself at the cost of other crops.

It is of considerable importance that the extent of the private holdings in rubber in Malacca, should be borne in mind, because of the part that they might play in any outbreak of a serious disease. There were in Ceylon among the coffee estates similar small holdings with coffee on them, when the coffee-leaf disease broke out, and that they played an important part in causing planters to give up coffee is known; they harboured the disease that the planter was fighting and were an ever-present source of re-infection along his borders. So might these small holdings in rubber serve for mischief, if an epidemic of like nature were to break out in Malacca. Some kind of watchfulness over their state is desirable; and the intelligence necessary for it exists upon the company's estates, but it is uncertain how far, those who might arrange for keeping an eye on the little holdings are alive to the need; reference seems rarely if ever to be made to it from the chair at Company meetings.

So many of the Rubber-planting companies began by the acquisition of holdings, often small, planted with rubber, that a stimulus was given to planting with a view to sale: doubtless a not inconsiderable part of the ground so planted has come under the control of men with a permanent interest in the crop; but there is a little land which will not fall into some planting scheme and bears trees which the owner is not interested in tapping, such as would be more useful and less dangerous to the state if the trees were replaced by something else. The alternative of tapping or eradicating after a certain number of years, perhaps in some cases, might profitably be imposed.

It is certain that the protection belts devised several years ago have not been retained.

The planting companies in Malacca now possess about 105,000 acres, of which 37 per cent. is not yet planted. Some of the companies admit that they have too much land; thus, two are considering the getting rid of a not inconsiderable amount, and the Nyalas Company during 1913 surrendered 5,700 acres; two other companies on the plea that the blocks were detached, and inconvenient therefore, have surrendered 645 acres, and another company has surrendered 263 acres of genuinely sterile hill side. On the other hand four dollar companies which are paying dividends have judged it to their interest to acquire more land to the extent of about 815 acres; and as even with these additions these four companies make but small charges their further expansion would seem likely to be profitable.

The land surrendered or which it is desired to sell, happens to be considerably more than the land acquired by other companies; but it is in no case in rubber, whereas some of the land acquired is.

growth of certain grasses is encouraged; under either system the estates seem to have attained generally the object aimed at, and the maintenance in that state is less costly than the attainment. Disc-harrows are in more extended use having, since 1911, proved themselves useful; and steam ploughs are in use on the Devon Estate.

There is probably no estate in Malacca which has not brought down its expenses considerably; and the company reports mention reductions in cost of varying amounts.

The average London prices for first quality Plantation and the amount imported, are given by Messrs. Lewis and Peat thus:—

Year.	*Average price.*	*Amount.*
1911	5s. 6d.	9,500 tons = 21,280,000 lbs.
1912	4s. 10½d.	18,000 „ = 40,320,000 „
1913	3s. 1d.	22,400 „ = 50,176,000 „

Fine hard Para did not fall proportionately, but from 4s. 7½d. to 3s. 2½d., because it is better than Plantation for certain purposes, is controlled by few strong hands able to hold up supplies, and has not the promise of such enormous expansion as has Plantation. That it should have been sold per lb. below Plantation once when the price was high, is because its 18 per cent. of dirt at a high figure becomes so very expensive; but allowing for its impurities, rubber for rubber it has never been cheaper than Plantation. Malaya must make its best product as good as Fine Hard Para for all purposes.

It is admitted on the London market that the quality of the produce of Malaya has improved. Some of this improvement may be ascribed to the increasing age of the trees, but most of it is to the credit of the planter. Earnest endeavours must be made to make Plantation to sell equally with Para; but for the present Plantation more by its volume than its value, competes with Para.

Although low class rubbers have been less abundant on the market lately than formerly, the part which raw plantation has played in driving these out is quite uncertain, for much of their decrease may be due to reclaimed rubber as the industry in reclaiming is assuming enormous dimensions, curiously without any satisfactory figures in regard to it being available, and the product takes a place in direct competition with low class rubbers: and it is to be borne in mind by those interested in producing Plantation, that such improvements may be invented in reclaiming processes as to bring reclaimed rubber to a grade, where its volume will affect the price of the raw product.

The second crop of Malacca formerly was tapioca; it has been the mother crop of very much of the rubber from the time when Mr. Tan Chay Yan and his syndicate planted the Bukit Asahan Estate;

but, with the cutting out of catch crops, the area under it has fallen to the fourth place. Both the acreage and export figures show this fall.

Year.	*Acres.*	*Average price of flake tapioca as declared on export from Malacca.*
1902	67,546	$5.59 per pikul (133.3 lbs.)
1903	71,958	5.03 „
1904	68,762	4.80 „
1905	65,968	6.34 „
1306	67,399	8.91 „
1907	16,753	9.22 „
1908	39,072	6.13 „
1909	—	5.92 „
1910*	18,135	6.35 „
1911	10,926	8.83 „
1912	16,643	8.89 „
1913	7,353	5.98 „

Excess of exports over imports of Malacca in pikuls (133·3 lbs.)

Year.	*Flake.*	*Pearl.*	*Flour.*	*Total excess.*
1909	66,727	64,567	6,830	138,124
1910	85,793	52,398	(import of 4,717)	133,474
1911	38,820	31,889	1,555	72,264
1912	28,157	31,873	1,690	61,420
1913	27,992	28,329	(import of 88)	56,233

The decrease of the crop has come at a time when prices have fallen very considerably; and it is a matter for congratulation that the Malacca estates in recent years have not only reaped the advantage of a return from the catch crop, but they reaped it when the return was good.

Along with the decrease in the growing of tapioca has come an enormous and most striking decrease in pig-raising. The following are the figures for the excess of the exports from Malacca territory of pigs over and above the imports.

Excess Exports over Imports.

1909	...	...	21,564 animals
1910	...	...	13,925 „
1911	...	...	7,640 „
1912	...	...	2,977 „
1913	...	...	106 „

The pigs used to go to feed the tin-mining towns chiefly, and also the adjacent parts of the Federated Malay States. They were raised by squatters who were allowed to establish themselves chiefly in the coconut plantations, and there, to fatten their swine with the 'ampas' or

*In this year under the Crown Lands Ordinance, 1886, the alienation of Crown Land for tapioca was stopped; but the use of tapioca as a catch crop for more permanent crops was not prevented.

refuse of the tapioca industry. Malacca used to have 'ampas' to spare, but now there is a small import of it, which is paid for through the higher price which pigs fetch in the local market. The rise in the price of pork in Malacca town has been about 43 per cent.

The following table gives the excess value of 'ampas' of either exports over imports or imports over exports, for the last five years.

Tapioca Refuse by Value.

Year.	*Excess Exports over Imports.*	*Excess Imports over Exports.*
1909	$12,269	—
1910	8,935	—
1911	4,958	—
1912	4,950	—
1913	...	$187

Gambier has not shown the same tendency to go down in area as has tapioca; on the contrary though many companies have been using it as a catch crop, and are talking about removing it, its area has been relatively steady. The excess exports over imports for the last five years have been as follows:—

1909	23,106	pikuls (133.3 lbs.)
1910	23.365	„
1911	20,227	„
1912	20,983	„
1913	20,060	„

It is stated that expert labour for the boiling it is now difficult to obtain, and that fuel for the purpose is not so conveniently handy as it was; moreover the price is falling. The price of gambier declared in Malacca for export has been on the average

1909	$12.33	per pikul (133.3 lbs.)
1910	12.78	„
1911	13.93	„
1912	13.53	„
1913	10.29	„

Coconuts have extended very little. They are so much grown mixed with fruit trees, that no separate return is possible; and the following figures are of the area under them, fruit-trees, pine-apples and other garden crops:—

1902	36,588	acres.
1903	37,397	„
1904	40,256	„
1905	40,767	„
1906	42,861	„
1907	44,766	„
1908	45,747	„
1909	46,439	„
1910	45,584	„
1911	47,355	„
1912	47,650	„
1913	46,348	„

The Malays, who own most of the trees give them no cultivation, and so little interest that they generally require compulsion for the removing a diseased tree. It was reported, ten years ago that the appointment of an Inspector of Coconuts had brought about an improvement in the state of the holdings, but the position is still unsatisfactory.

Of crops from permanent planting, coconuts are rather unreliable— responding much to reasons, as the following figures of excess exports over imports of copra show:—

1909	...	...	...	39,542 pikuls.
1910	...	...	...	56,222 „
1911	...	...	...	51,932 „
1912	...	...	...	38,834 „
1913	...	...	...	37,022 „

The manufacture of Kabong sugar from the palm *Arenga saccharifera* is decreasing considerably; and the trees, which are little cared for, although they give the black rope of the country as well as sugar, are much neglected, and often may be seen to stand dead in the Malay holdings along with coconut palms, long after their trunks should have been removed.

The excess exports over imports have been:—

1909	...	...	...	3,722 pikuls.
1910	...	...	...	1,912 „
1911	...	...	...	2,282 „
1912	...	...	...	1,934 „
1913	...	...	...	1,172 „

Sago is made but irregularly in Malacca; and though the raw product has been produced in sufficient quantities for export during the last three years, the manufactured product has been insufficient, as the following figures show:—

	Flour.		*Raw Sago.*	
Year.	*Excess of Exports over Imports.*	*Excess of Imports over Exports*	*Excess of Exports over Imports.*	*Excess of Imports over Exports.*
1909	1,442 pikuls.	—	No trade.	No trade.
1910	269 „	—	No trade.	No trade.
1911	387 „	—	920 pikuls.	—
1912	—	409 pikuls.	4,870 „	—
1913	—	480 „	680 „	—

The area under areca-nuts or betel-nuts has hardly changed; and the output has been fairly steady, except that 1911 was a rather bad year. That year proved a very good one for coconuts and for fruit trees in Jasin was a record year: it is therefore noteworthy that areca-nuts should not have been plentiful in it.

Excess exports of areca-nuts over imports:—

1909	...	...	...	10,282 pikuls.
1910	...	...	...	12,579 „
1911	..	...	...	9,176 „
1912	...	...	...	12,210 „
1913	...	...	...	11,085 „

Ginger, like betel-nuts, was in 1911 less, in the amount exported.

Excess exports over imports of ginger:—

1909	...	...	...	3,907 pikuls.
1910	...	...	...	1,771 „
1911	...	...	...	1,119 „
1912	...	...	...	2,069 „
1913	...	...	...	1,266 „

The export of Pepper has decreased much.

Year.	*Excess Exports over Imports.*	*Excess Imports over Exports.*
1909	159 pikuls.	—
1910	228 „	—
1911	68 „	—
1912	—	81 pikuls.
1913	20 „	—

Padi and coconuts happen fortunately to be the only crop plants which the locusts, *Pathytylus danicus*, have damaged as yet by eating, and this in Malacca only to a slight extent. The insects feed on the coconut leaves; but the padi, they nibble and damage, biting through the haulms but not devouring then; however, the result is as injurious. They were reported as doing damage in this way in the Alor Gajah District, in 1912, and they repeated it in 1913, locally. From other pests the padi has been relatively free. But the crop has suffered from the effect of the removal of forest about the sources of the streams, wherefrom these come in spate after heavy rain and then run low until the next storm. The result has been that the fields near to the central water course of each valley have been flooded out, and are now often in rough sedges. As a remedy it is intended to spend larger sums than usual in removing obstructions from the channels, so that the water may run off freely; but it is doubtful if anything short of tank-irrigation will make the crop what it might be. The extent of the crop has been narrowed, because of the Malay labour drawn off into the rubber estates, but the new reduction of wages operates against a continuance of this. In order to protect those who do plant against the ravages of vermin finding a harbourage on the fallows, pressure is being put on the owners of the holdings, under the Malacca Lands Ordinance, 1886, to make them to cultivate and to make them to keep clean the borders of their holdings. The effect of the pressure was not evident in the returns of area for 1913.

Year.	Area under Rice.	Value of Padi as declared on export.
1902	32,185 acres	—
1903	36,074 „	—
1904	37,369 „	—
1905	37,229 „	—
1906	38,201 „	$2.44 per pikul.
1907	39,067 „	2.57 „
1908	39,497 „	2.66 „
1909	41,198 „	2.29 „
1910	39,997 „	2.29 „
1911	40,410 „	2.53 „
1912	40,260 „	3.53 „
1913	39,040 „	3.23 „

The price of padi has been better than it used to be; and the demand vastly increased, so that export has ceased to be greater than import. This is shown in the following table :—

	Padi.		*Rice.*	
Year.	*Excess of Exports over Imports in pikuls.*	*Excess of Imports over Exports in pikuls.*	*Excess of Exports over Imports in pikuls.*	*Excess of Imports over Exports in pikuls.*
1906	20,617	—	—	251,612
1907	32,473	—	—	250,587
1908	23,309	—	—	279,283
1909	17,492	—	—	261,017
1910	10,606	—	—	316,460
1911	4,193	—	—	382,844
1912	—	8,364	—	462,875
1913	—	3,831	—	436,362

In the opinion of the writer, there is not a crop in Malacca offering more interest at present, than that of rice, nor a crop so deserving of whatever help can be given to it. It appears that hollows in rubber estates, the clean weeding of which costs more than the weeding of rubber land should, would be of greater use to the state as store places for water for rice lands than cultivated and under Hevea. The Malays of Malacca have tried no new crops.

Singapore Island.

The planting of fresh land in rubber continues in Singapore island on a small scale, the area being returned at 34,960 acres.

1904	78	acres.
1905	1,110	„
1906	1,460	„
1907	4,190	„
1908	4,745	„
1909	7,600	„
1910	20,000	„
1911	29,150	„
1912	34,000	„
1913	34,960	„

The Singapore estates are much more completely planted than the Malacca estates; but their planting commenced on the whole so much later that they are less in bearing: indeed their planting mostly dates back to 1909, although the oldest rubber trees in the island are now in their thirty-fifth year. The year 1913, saw the tapping area on several of the estates increased by about 25-35 per cent., which is an indication that they are rapidly coming into bearing. Just about half of the total acreage in the island under rubber belongs to ten estates; therefore in Singapore, as well as in Malacca, there is a very large area of rubber in private hands. Privately owned rubber trees in Singapore are often packed away among coconuts and fruit trees, according to an oriental method of averaging the risk, and these count far less in the long run than properly planted trees. However, all are generally free from pests and plant diseases.

The ten larger companies hold about 18,260 acres, of which 93 per cent. is planted up.

A cessation from rubber planting appears probable leaving 25 per cent. of the land in the island under it.

Some of the Singapore estates in 1913, had difficulties in realising their estimates, but reached or came very near to them ultimately, though not always without departing from their tapping programme.

There is a little neglected rubber in the island as there is in Malacca.

The catch crop—nurse crop of the estates—has of course, been Pineapples, and now has come the time for cutting them out. The result is a planting of pineapples on new land outside the estates, often with rubber; but the pineapples are more meant than the rubber.

The year 1913, gave the largest crop of this fruit on record—so large that the canneries could not handle the supply, and offered but fifty cents per hundred for the fruit delivered at their doors. At other times in the year the price was as high as six dollars per hundred, similarly delivered. At fifty cents per hundred it hardly pays to cut the fruit. Some of the factories have not had full success with their machinery.

The waste goes to feed pigs—mostly to fatten for killing pigs imported lean from Bangkok and the Dutch Indies.

Tapioca has little hold in Singapore and its largest area in the agricultural statistics of recent years is but 150 acres; it is grown as a vegetable and not for use in mills.

The last indigo in the island, which was grown as a catch crop on the Bukit Sembawang Estate, is being removed.

Coconut palms in Singapore, in 1913, gave a very good crop; but unfortunately they were locally attacked by pests in the later six months, notably by *Brachartona catoxantha* in the north-east of the island. The damage done by these insects will tell on the 1914 crop, and the

Trafalgar Estate estimates a diminution in yield of about 12 per cent., as the consequence of the outbreak on their trees. The outbreak is described above on page 207.

In the centre of the island, and in a less degree towards the south-west, the Palm-weevil was more abundant than it should have been, as the result of the cutting out of coconut palms for rubber. The attack began in both places, in Chinese holdings, and upon the removal of young trees, whose trunks were not destroyed promptly.

The cultivation of coconuts is extending slightly.

In consequence of the extensive consumption of coconut oil in Singapore, the trade statistics do not yield figures showing in any simple way the position of the coconut industry. They show in the first place a diminution in the export of oil with a slight recovery in 1913, thus:—

Year.	*Imports.*	*Exports.*	*Excess of Exports over Imports.*
1906	41,191	168,498	127,307
1907	40,162	159,801	119,638
1908	32,138	149,078	116,940
1909	30,158	135,578	105,420
1910	23,987	99,211	75,224
1911	25,604	98,860	73,256
1912	25,649	81,499	55,850
1913	17,075	85,480	68,405

The price that has drawn the export has nevertheless been increasing since 1908.

Year.	*Price per pikul of the oil as declared on exporting.*
1906	14.89 per pikul.
1907	17.38 „
1908	13.49 „
1909	14.98 „
1910	17.81 „
1911	18.50 „
1912	19.49 „
1913	21.82 „

Of copra there is a greater import than export, the figures for the same period being:—

Year.	*Imports.*	*Exports.*
1906	635,385	427,506
1907	927,652	654,869
1908	1,171,039	968,658
1909	1,095,312	918.948
1910	1,335,477	1,319,644
1911	1,246,286	1,161,102
1912	1,122,587	991,448
1913	1,374,201	1,154,122

Assuming that 100 pikuls of copra yield 62 pikuls of oil, and calculating the excess exports of all as copra, we get the following figures:—

Year.	*Excess Imports of Copra.*	*less.*	*Excess Exports of Oil calculated as Copra.*	*leave.*	*Excess Imports calculated as Copra.*	*Excess Exports calculated as Copra.*
1906	207,879		205,334		2,545	—
1907	272,783		192,966		79,807	—
1908	202,381		188,613		13,768	—
1909	176,364		170,032		6,332	—
1910	15,833		121,329		—	105,496
1911	85,184		118,155		—	32,971
1912	131,139		90,981		41,058	—
1913	120,079		110,331		9,748	—

The figures indicate that only in exceptional years does Singapore island produce for export coconut products; but the variation towards either side is extraordinary. The average imports over the 8 years have been 1,113,492 pikuls of copra and of the 6 years, omitting 1910 and 1911, 1,054,362 pikuls; but in 1910—the most fruitful year—there were imported 220,000 pikuls above this—a circumstance to be attributed to the splendid crops, not only of Malacca (which have been mentioned on page 221 above) but of the whole of the east of the Peninsula and of many of the not-remote Dutch Indies. The equivalent of this 220,000 pikuls was re-exported either as copra or as oil, the excess of imports averaging 25,543 pikuls of copra disappeared, and an export equal to 105,496 pikuls occurred. In 1913, the registered imports were higher still; but the tremendous excess export of copra (as copra or as oil) has not been attained.

The average prices of copra declared for export from Singapore have been:—

1906	$8.47	per pikul of 133.3 lbs.
1907	9.79	„ „
1908	7.12	„ „
1909	8.31	„ „
1910	10.30	„ „
1911	10.02	„ „
1912	10.69	„ „
1913	12.73	„ „

The areca-nuts in Singapore yielded in 1913 better than in 1912, as the coconuts did, so that there has been an increase of exports; but on the whole they receive little attention. The figures for the last five years are:—

Year.	*Excess of Exports over Imports.*	*Average Price.*
1909	81,612 pikuls	$4.54
1910	136,492 „	5.45
1911	86,117 „	5.49
1912	18,803 „	5.58
1913	23,038 „	7.15

Gambier is disappearing from the island. Under Malacca the diminution of its price has been given; and from that cause arises its decrease in Singapore island. Pepper cultivation seems slightly to be increased. Sugar-cane cultivation, for eating only, is unchanged. Rice has not existed in the island for a very long time. The few nutmegs in the island produce a little fruit. A small experimental area has been planted with Cacao.

Durians yielded very well in December, 1913, and so did Rambutans; but the crop of Mangosteens was not good.

The amount of fruit which Singapore imports is now very considerable. The Muar river enjoys a large share of this trade, Sarawak and Siam a not inconsiderable portion in special lines.

The demand for vegetables is so great that their prices are very high. In the island there is a slight increase of vegetable growing—katiang, ladies fingers, brinjals, etc., and a little planting of bananas.

The planting of " Pisang Batu " for leaf plates, leaf wrappers and a substitute for string is extending.

Sweet potatoes are the chief root crop of Singapore; and they are less extensively grown than might be expected. The big alocasia comes next in importance.

With the intention of attempting the introduction into Singapore of a new root-crop the lesser yam (*Dioscorea aculeata*, Lamk. or *D. fasciculata*, Roxb.) was brought in 1913, into the Economic garden: it is a tuber, which constitutes a large part of the food of the labourers in some parts of India, and is, moreover, when suitably cooked good eating: but thereafter it was found that a Chinese cultivator on Holland Road had already commenced the growing of it. It is curious that this plant has not hitherto found a lodgement here, yet has been for a very long time an important food plant in the Eastern Archipelago, and in India. Rumphius, who lived in the Dutch Indies from 1653 to 1702, and became Governor of Amboyna, said, that in his time it was being grown about Batavia by immigrants, who had come from the East; yet Ridley was able to write two centuries later, in 1908, that he had never seen the species nor could find evidence of its occurence in the Malay Peninsula.

Lemon oil grass is still in cultivation and distilling is done on a small scale; but the interest in it has diminished considerably. The Java citronella oil, along with which the Singapore product should sell, is absorbed very readily on the market in Europe, though at a narrow margin of profit.

Penang and Province Wellesley.

The agriculture of Penang shows little change. Nutmeg and Clove cultivation is decreasing; the output of the year has been small.

The coconut and areca nut crops were fairly good. Mangosteens were produced freely, but not in the same plenty as in 1912, when the yield was remarkable. Their lowest price was 3.50 per hundred. An impression gained in Penang is that from planting a few years back, an increase in the production of this fruit will soon follow. Durians fruited normally in 1913. The cultivation of plantains is not increasing. The local vegetable crop seems inadequate, but there is no sign of extension within the island.

The rice crop of 1912-13 was not good; but that of 1913-14 is very good.

The last of the sugar-cane, grown for the manufacture of sugar, has disappeared from Province Wellesley; its place having been taken by rubber. Towards the end an experiment was made on the Central Factory plan, small areas of land being allotted to cultivators who were to cut the crop as required; but it failed, the cane been ill-grown. This is of great interest as illustrating the difficulty, that there would be, in establishing such an institution as a Central Factory in the Province—a difficulty illustrated also by the fact that small holders of the same class often turn out raw tapioca, which is hardly marketable; but such men seem to be more fortunate when they turn their attention to raising crops which require the gardener's skill only; and a considerable number of them, chiefly in the Central and Southern divisions, are raising pine-apples, gourds, beans, brinjals, etc., as catch corps among very young rubber or coconuts. These men appear not to be tyring anything new; but in the northern division, in 1913, a small acreage was planted up by Malays with the lesser yam; (see page 227 above) and so great was the profit that it appears as if the culture will become established.

One most interesting new cultivation in the Province, is that of Arrowhead—*Sagittaria saggitifolia*—grown on an extending area of rice-land near Bukit Mertajam, by Chinamen for feeding pigs, and apparently profitable. About three crops are grown in the year.

The fruit trees in the Province in a very large measure want renewing; they are trees which were planted round the country houses of well-to-do Chinese, from whose hands in some cases they have become company-property. But they are now of little value.

There is a trade from Penang to Calcutta of small dimensions in fruit, chiefly in mangosteens and the best plantains, which might be fostered and become something; pineapples, which squatters are growing in the Province, might be exported also.

Rubber in the Province and Penang is credited with the following increasing acreage :—

	Province Wellesley.	*Penang.*
1905	Nil	Nil
1906	4.009	Nil
1907	4,833	50
1908	7,894	550
1909	14,166	1,450
1910	15,501	2,648
1911	24,725	4,094
1912	30,530	5,800
1213	34,766	6,310

The estates of the island and in the Province together cover almost the same area as those of Singapore island, and are almost of the same age. A little later, comparisons will be interesting. But whereas we found a very large amount of privately owned rubber in Singapore, we find very little in Province Wellesley where 70 per cent. of the total area in rubber make parts of 18 estates there.

Only one of these estates is without coconuts: and some are extending by planting the one crop, and some by planting the other, in such a way that rubber has only a small preference over coconuts.

In reserve the estates hold 41 per cent. of their area. If we allow to rubber and to coconuts an equal extension out of this 41 per cent., that is 20 per cent. for each, not much more than 22 per cent. of the whole province seems likely to go into rubber.

The estates have been disappointed in the yield of Coconuts; one estate for instance with 33,000 trees almost all in bearing gave

in 1910-11	1,000,316 nuts.
in 1911-12	670,039 „
in 1912-13	713,658 „

when 900,000 were expected.

The differences are the effect of the seasons, and it is to be feared of conditions, probably chiefly connected with the soil water which we cannot easily control. These conditions make it very hard to estimate accurately the crop in advance; and unfortunately the good year of 1910, to which many of the current estimates date caused expectations to be inflated.

Estates beyond the borders of Province Wellesley have made the same complaint, that the years which followed 1910, disappointed them.

Estates built up out of old Chinese holdings are in some cases planted with different races of coconuts on no system.

Tapioca in the Province seemed at the beginning of 1913 to be extending as it had done in 1912, in spite of a falling price; but the price continued to fall and went so far as to make harvesting unprofitable. Such a large drop is rather calamitous, occurring within the growth of one crop, and the more so as the Province is not only not at the stage in its rubber plantations when catch crops can be generally dispensed with, but has a pig industry dependent largely on the tapioca refuse.

The following is the acreage returned under Tapioca:—

	Province Wellesley.	*Penang.*
1902	10,800	about 150
1903	11,145	about 80
1904	11,145	about 60
1905	12,035	about 60
1906	37,690	about 100
1907	39,165	— 130
1908	14,537	— 110
1909	14,101	— 120
1910	11,006	— 140
1911	9,700	— 170
1912	11,290	— 130
1913	7,785	— 180

The excess of exports over imports of tapioca from Penang have been:—

	Flake.	*Pearl.*	*Flake and Pearl together.*
1909	35,571 pikuls	236,765 pikuls	272,336 pikuls
1910	26,609 „	180,286 „	206,895 „
1911	10,891 „	248,755 „	259,646 „
1912	9,441 „	265,824 „	275,265 „
1913	8,645 „	309,841 „	318,486 „

The excess of exports over imports, or the reverse, of tapioca flour and refuse from Penang have been:—

	Flour.		*Refuse.*	
	Excess of Exports over Imports.	*Excess of Imports over Exports.*	*Excess of Exports over Imports.*	*Excess of Imports over Exports.*
1909	150,648 pikuls.	—	18,239 pikuls.	—
1910	44,948 „	—	8,339 „	—
1911	—	25,097 pikuls	7,212 „	—
1912	27,278 „	—	—	29,368 pikuls.
1913	4,332 „	—	1,027 „	—

So that latterly Penang and the Province Wellesley have used up most, if not all, of the refuse available from the tapioca manufacture.—Moreover the flour, the import of which has never been below 30,000 pikuls per annum, has been the more and more worked up into products for human consumption, thereby liberating more and more refuse for local use.

The pigs which are fattened on this refuse are chiefly exported to Ipoh and other centres of industry, by rail. The excess export over import of them has been :—

1909	...	...	... 2,527 animals
1910	...	...	... 5,768 „
1911	...	...	... 10,802 „
1912	...	...	... 17,423 „
1913	...	...	... 16,849 „

That the growth of this trade has marched with the diminution of the excess export of tapioca flour and refuse is evident ; and it is almost certain that the cessation of the abundant supply of tapioca refuse, which in Malacca caused to cease the export trade in pigs, will choke the trade of Penang also, where the price of pork has been rising, as it did in Malacca. Therefore it is earnestly to be hoped that the price of tapioca will rise enough to make its harvesting remunerative, for all three reasons, viz: (1) for the sake of a profit to the grower, (2) for the sake of a business to the manufacturer, and (3) for the sake of a cheap pig food from the refuse. The manufacture of material for industrial alcohol might make the tapioca to pay, where otherwise it does not.

The fall in price of tapioca may be thus illustrated from the Singapore market. The figures are of the price given in the first week of each month as they appeared in the "Straits Times," of December 31st, 1913.

1912.				1913.			
January	9.20	July	9.25	January	7.60	July	5.95
February	8.90	August	9.15	February	7.30	August	5.35
March	9.10	September	9.00	March	7.15	September	5.20
April	9.50	October	8.75	April	6.50	October	5.01
May	9.10	November	7.50	May	6.30	November	4.70
June	9.30	December	7.70	June	6.25	December	4.40

Sago refuse goes to fatten pigs along with the tapioca refuse; and the same absorption of what is available has been going on. The former considerable export of flour has been steadily reduced, as the second column of the following table shows :—

	Imports of Sago Flour.	*Export of Sago Flour.*	*Excess of Exports over Imports.*
1906	30	10,896	10,866
1910	1,672	5,799	4,127
1911	5,816	5,440	(Excess Imports of 376 pikuls).
1912	187	4,568	4,381
1913	83	2,057	1,974

The excess exports over imports of pearl sago over these years have been:—

1909	...	...	... 96,822	pikuls.
1910	...	...	... 69,707	,,
1911	...	...	... 79,487	,,
1912	...	...	... 93,273	,,
1913	...	...	... 91,124	,,

The excess import of sago flour occurred in the same year as the excess import of tapioca flour, i.e., 1911: it came through Singapore, apparently, as also did the major part of the excess import of tapioca flour, the local area under tapioca having been restricted somewhat. With the expansion again in 1912, of the local area, this excess import was replaced by an excess export.

The Penang poultry trade shows a slightly larger export but a greatly increased import. This import is largely from Kedah, the birds being exported to Port Swettenham, etc. The price of poultry is also rising.

Trade in Poultry Counted by Dozens.

	Imports.	*Exports.*	*Excess of Exports.*
1909	39,559	59,864	20,305
1910	40,318	66,477	26,159
1911	29,090	71,622	42,532
1212	35,646	67,881	32,235
1913	54,913	76,041	21,128

The area under coconuts is not separately returned, but the following figures of the area under fruit trees and gardens indicate both a wide extent and a slight increase in the Province accompanied by little change in the island.

	Province.	*Penang.*
1902	60,000	29,940
1903	60,186	29,946
1904	60,186	29,543
1905	61,295	29,751
1906	62,900	29,730
1907	64,101	29,430
1908	64,122	29,700
1909	63,743	29,226
1910	64,974	30,644
1911	65,692	29,703
1912	66,703	30,030
1913	69,218	30,630

Nineteen estates in Province Wellesley own 14,084 acres of coconuts, of which only just over one quarter is in bearing as yet.

Those apparently extraordinary fluctuations in the trade of Singapore, in coconut products, do not appear in the Penang trade statistics.

	Excess of Exports over Imports of Oil.	*The same calculated as Copra.*	*Excess Exports over Imports of Copra.*	*Excess Exports of Oil and Copra calculated as Copra.*
1909	27,385	44,169	95,280	139,449
1910	27,779	44,790	172,679	217,469
1911	26,433	42,634	126,780	169.414
1912	33,631	54,244	83,497	137,741
1913	29,826	48,106	92,636	140,742

The figures very well reflect the varying crop, which was excellent in 1910, and was again better in 1913 than in 1912. In addition to an export in oil and copra, Penang exports nuts in increasing quantities to Madras and other Indian ports.

Areca nuts which yielded so well in Malacca in 1910, when coconut palms did, behaved similary in Penang. Since then their excess export has fallen somewhat.

	Excess Exports over Imports.
1909	100,463 pikuls.
1910	114,854 „
1911	95,546 „
1912	97,688 „
1913	86,437 „

Although the area under nutmegs and cloves in the Province Wellesley is reported as unchanged, the last nutmeg trees on Bukit Mertajam are now dying; and there seems to be no likelihood of fresh planting there. The plantations in the island of Penang have decreased considerably of late years, and the excess of exports over imports has narrowed, more than seasonal variation accounts for.

Area returned as under nutmegs and cloves :—

	Province Wellesley.	*Penang Island.*
1902	—	10,500 acres
1903	—	10,527 „
1904	—	10,270 „
1905	—	10,070 „
1906	—	9,866 „
1907	100 acres	9,410 „
1908	500 „	9,240 „
1909	664 „	8,930 „
1910	450 „	8.825 „
1911	550 „	6,750 „
1912	500 „	6,310 „
1913	500 „	6,000 „

	Import of Nutmegs into Penang.	*Export from Penang.*	*Excess Exports.*
1909	2,350 pikuls	5,154 pikuls	2,804 pikuls
1910	2,608 „	3,802 „	1,194 „
1911	2,988 „	5,064 „	2,076 „
1912	3,997 „	5,816 „	1,819 „
1913	3,643 „	4,409 „	766 „

Cloves, however, have latterly had fairly good years, so that trade has been:—

	Import of Cloves into Penang.	*Export from Penang.*	*Excess of Exports over Imports.*
1909	944 pikuls	1,677 pikuls	733 pikuls.
1910	1,276 „	1,419 „	143 „
1911	719 „	2,323 „	1,604 „
1912	475 „	3,981 „	3,506 „
1913	915 „	2,305 „	1,390 „

Penang and the Province consume considerably more pepper than the little that they produce.

The area under rice has been returned as follows:—

	Wellesley.	*Penang.*
1902	48,500	7,700
1903	49,351	7,690
1904	49,351	7,660
1905	49,368	7,660
1906	48,478	7,650
1907	44,456	7,450
1908	45,808	7,530
1909	46,274	7,567
1910	46,138	7,120
1911	45,200	6,129
1912	44,950	6,320
1913	45,977	6,620

The crop of 1912-1913 was not good; but the crop of 1913-1914 proved excellent.

Dindings.

The rubber estates in the Dindings fall into two divisions: one is constituted by the Sandycroft Estate alone; the other consists of four smaller estates near the Lumut river. Sandycroft is celebrated for the large yields that some of its trees used to give, and its land within the Dindings is all planted up. The other estates are extending still. They have land to the extent of 6,079 acres, and have planted 55 per cent. of it.

One of these estates has been depending for development on the profit of tapioca as a catch crop; and that is failing it now. Tapping of young trees was started in 1912 on one estate, but stopped again when price of rubber fell.

Coconut-groves, land under fruit trees, and garden patches make up about 6,500 acres, nearly half of which is the young, and promising Dindings Coconut Company's Estate on the Bruas river. The seed nuts came from Penang.

The land round the District Officer's house has been used somewhat as an experimental ground to see how various plants grow; but the officers succeed one another at intervals too short for the purpose to be carried out to much effect. Cloves on this piece of land have grown satisfactorily.

Tamil labour is altogether prevalent in the Dindings, and the Tamils show some tendency to try crops of their own land; thus Sesamum, Ragi (*Eleusine Coracana*) and Chillies are to be seen in small patches near Lumut. This tendency seems to afford a possible opening for widening the very meagre list of crop plants of the peninsula.

Rice which was grown some years ago on the northern border, and which went out of cultivation, has been planted again to the extent of about one hundred acres.

CROTON SPARSIFLORUS, Morong,

an American Invader.

Close to the East Wharf in Singapore, near to the Lagoon Dock, and west of the Peninsula and Oriental Steamship Company's wharf, occurs in some quantity on waste ground an American plant by name *Croton sparsiflorus*, whose advent is of some interest. For several years it has been spreading in Bengal and Assam, from the coast inland, in a way which strikingly demonstrates its dependence on man, and also shows that without hooks or barbs on its seeds or stickiness or any other device for attaching them to objects, a plant with an abundant fertility, may get itself spread effectively through trade. Now that it has reached Singapore, and become established, we shall probably witness its steady spread from the new centre along trade routes in Malaya. Nothing eats it; its smell protects it from cattle; and apparently its natural enemies have been left behind in its migration. Fortunately it is not aggressive as a weed, but for the most part confines itself to waste places.

Its home is on the River Plate, and it was first described from Paraguay. Its appearance in the East was recorded in 1905, when Sir David Prain, in an account of the vegetation around Calcutta (Records of the Botanic Survey of India, vol. iii., page 276) stated that it was abundant in waste places to the south of the city, particularly about Diamond Harbour. From a paper published later by Professor P. J. Brühl, (Journal of the Asiatic Society of Bengal, new series, 1908, page 603) we learn that as early as 1901, one of these waste places was within six miles of the city (four miles from the docks), and that in 1903 or 1904, it advanced as far as the waste ground

between the Botanic Gardens and the Bengal-Nagpur Railway Company's goods sidings at Shalimar, whence there is a railway ferry service to the other side of the river Hughli, by which goods waggons are sent over to the docks.

At a later date than the first record, the plant was found to be abundant about Chittagong and to have been there at least since 1898, for Mr. D. Hooper, late Economic Botanist to the Botanic Survey of India, had preserved a specimen collected in October of that year; further Professor Brühl obtained information from one of his students that the plant had been seen ten years before 1907, on the railway line side between Chandpur and Akharara—two stations on the Assam-Bengal railway, which serves Chittagong. Examination of the line about Chandpur in 1908 showed that it had become abundant enough to indicate its establishment several years earlier.

After Calcutta, Chittagong is the second port at the head of the Bay of Bengal; Diamond Harbour and Chandpur are only river stations, where sea-going boats do not discharge cargo; Akharara is a little inland.

The abundance of the plant about Chittagong and Chandpur indicates the east side of the Bay of Bengal to be the one on which it obtained its first lodgement; and the way in which it was observed to approach Calcutta from Diamond Harbour forbids the belief that it was first established on the Hughli. Probably it found a home in the beginning at Chittagong; thence it reached Chandpur along the railway; from Chandpur it was brought to the Hughli by the Sundribans steamer traffic: and now it has reached Singapore, perhaps from Chittagong, but more probably from Calcutta.

Its further spread in India during the last few years has been recorded (Proceedings of the Asiatic Society of Bengal, 1910, page ci.; 1911, page cxxxii.; and 1912, page cxiii). It has appeared at intervals all along the Assam-Bengal Railway from Chittagong to one terminus at Gauhati and beyond the other terminus to Makum Junction, on the Dibru-Sadiya Railway, being always found at places where goods are unloaded: and it has reached Narayanganj near Dacca which is connected with Chandpur by a steamer service. It may be expected to travel along the railway from Narayanganj through Dacca to Jaganathganj slowly, because there is very little through traffic; it is sure soon to reach Goalundo and thereby the Eastern Bengal Railway system; from Calcutta it is likely to travel first towards Nagpur and Madras, and afterwards in other directions along the railways.

There is only one easy way of accounting for the travelling of its seeds; and that is by assuming that they get enmeshed in the gunny wrappings of packages. By reason of the greater use of gunny wrappings in India than in the Malay region, it is travelling faster there than it will in Malaya.

Croton sparsiflorus grows to a height of about two feet or sometimes to three feet. Its stems are woody and rather wiry, a single stem arises from the root, and at a height of about six inches branches into three or four, which again branch repeatedly candelabra-wise. The root system is not extensive; and the plant is easily dislodged. Its leaves are 1-2½ inches long, lanceolate, rounded below, with small blunt serrations, dark green, with stellate white hairs below. The smell of the plant is rather unpleasant.

The flowers are formed on upright open racemes, the females below, and the males above and much more numerous. The axis carries stellate hairs. The female flowers are 2-6 in number with five sepals and small orange-red glands within them, and a tri-carpellary ovary as is characteristic of its order—the Euphorbiaceae. The male flowers are along the axis in clusters of 3-4 or fewer, on short pedicels; they have five sepals, five small white petals, five glands and a bunch of about fifteen stamens rather conspicuous by reason of their white anthers. The seeds are about one sixth of an inch long, coloured and shaped rather like the seeds of the castor oil plant, with a white caruncle and a surface that is only microscopically rough.

I. H. BURKILL.

KENARI SEEDS.

The following Correspondence is printed here for record:—

Imperial Institute, London, S.W.,
16th October, 1913.

SIR,

The Imperial Institute has received a request from a firm of confectionery manufacturers in the United Kingdom for a sample of the fruits or kernels of *Canarium commune*, L., which are stated to be suitable for use as a substitute for almonds.

This tree is said to be grown in the Moluccas for the sake of its fruits, which are also stated to be commonly eaten in Java. It is possible that supplies of the fruits or kernels are obtainable in the Straits Settlements, and if so I shall be very much obliged if you will send me a sample of a few pounds.

I shall also be grateful if you can let me know whether any firm in the Straits Settlements can undertake to export the kernels or fruits, and if so at about what price the product would be quoted.

I am, Sir,
Your obedient Servant,
(Signed) WYNDHAM R. DUNSTAN.

The Director of Gardens, Singapore.

Botanic Gardens, Singapore,
31st January, 1914.

SIR,

In response to your letter No. 3102/1913, dated 16th October, 1913, I have the honour to send to you a small consignment of the seeds of *Canarium commune*.

These seeds are imported into Singapore and sold at one cent a piece for eating. It is unlikely that any firm of merchants here could find a trade in them to their profit. Nevertheless I should value any report that you care to make upon these seeds as we might try to bring in the tree as a fruit garden tree. Similarly I should value any report which you may be willing to make upon seeds, to follow, of *Canarium rufum* from those gardens, where it fruits freely and where the Chinese 'amahs' pick them up and eat them.

I have the honour to be, Sir,
Your obedient Servant,
(Signed) I. H. BURKILL,
Director of Gardens, S.S.

The Director,
Imperial Institute,
London, S.W.

No. 1110/1914.

Imperial Institute, London, S.W.,
7th April, 1914.

SIR,

I have the honour to enclose a report on a sample of *Canarium commune* seeds which was forwarded to the Imperial Institute by the Director of Gardens at Singapore, with letter dated 31st January, 1914

I have etc.,
(Sd). THOMAS A. HENRY,
for Director.

H. E. the Governor,
Straits Settlements.

IMPERIAL INSTITUTE.

Result of the examination of seeds of *Canarium commune* from the Straits Settlements.

Imperial Institute No. 52434, dated, 7th April, 1914.

REFERENCE.—Letter dated 31st January, 1914, from Director of Gardens at Singapore.

NUMBER OF MARK AND WEIGHT OF SAMPLE.—Seeds of Canarium commune. Weight 1½ lb.

DESCRIPTION.—Seeds or nuts measuring about 1⅜ inch in length and ⅞ inch in diameter, somewhat resembling Spanish chestnuts in shape, and pale brownish grey to dark brown in colour. The shells were about ⅛ inch in thickness, and very hard.

The nuts consisted of shell, 87.1 per cent.; and kernel, 12.9 per cent. Most of them contained at least 2 kernels (about 30 per cent. contained 3 kernels), but a few contained only one. The kernels had a chocolate-coloured coat, enclosing a cream-coloured interior which had a pleasant oily taste.

The kernels were analysed with the following results:—

RESULTS OF EXAMINATION EXPRESSED ON MATERIAL AS RECEIVED.—Moisture	...	per cent. ...	... 2.9
Crude proteine	...	„ „ ...	... 13.5
Consisting of			
True proteins	...	„ „ ...	12.9
Other nitrogenous substances	...	„ „ ...	0.6
Fat ...	...	„ „ ...	... 72.3
Starch, &c. ...	...	„ „ ...	... 7.4
Fibre ...	...	„ „ ...	... trace
Ash ...	...	„ „ ...	... 3.9

NUTRITIVE VALUE.—Nutrient ratio:—(the ratio between the percentage of crude proteins and the sum of the percentages of starch and fat, the latter being first converted into its starch equivalent) ... 1 : 12.3

FOOD UNITS:—(the total obtained by adding the percentage of starch to 2.5 times the sum of the percentages of fat and crude proteins) ... 221.9

COMMERCIAL VALUATION AND REMARKS.—The kernels of these nuts have a very high food value, and the proportion of fat is large, viz., 72.3 per cent. as against 65 per cent. in the case of walnuts, filberts and hazel nuts. The difficulty of breaking the shells would, however, prevent the use of the nuts in Europe for dessert purposes.

If the nuts were shelled locally and the whole kernels alone exported in good fresh condition, the product might perhaps find a market in European confectionery; but the kernels have no special advantage in taste over the kinds already used for this purpose, and as the nuts yield only 13 per cent. of kernels, the extraction might be unremunerative at the price obtainable.

RAINFALL

at the Director's house, Botanic Gardens, Singapore, during the second half of the year, 1913.

Readings taken always at 8 a. m. and credited to the date in which the twenty-four hours begin.

Day.	July.	August.	September.	October.	November.	December.
1	...	...	...	0.10	0.37	0.42
2	0.81	0.01	...	...	0.07	0.27
3	0.02	...	0.17	...	0.84	0.27
4	...	0.24	..	0.01	0.32	...
5	0.20	Trace	0 82	1.38	Trace	0.26
6	...	0.07	1.02	...	Trace	0.16
7	0.31	...	1.03	0.06	...	0.12
8	0.36	...	0.20	Trace	1.30	0.49
9	0.11	0.64	...	...	0.62	...
10	0.20	0.30	0.40	...	0.29	0.01
11	...	Trace	0.78	...	0.21	0.05
12	...	0.27	0.76	0.03	1.73	0.20
13	1.08	...	...	0.58	0.02	0.27
14	...	0.14	...	0.03	1.25	0.49
15	...	...	0.33	0.96	0.21	3.20
16	...	0 08	0.71	0.27	1.47	Trace
17	Trace	...	0.02	0 21	0.07	0.33
18	...	...	0.30	0.76	0.24	Trace
19	0.11	...	...	...	1.83	...
20	0.02	...	0.03	1.76	Trace	0.06
21	...	0.43	0 32	1.27	..	0.10
22	...	...	0.03	0.22	0.23	0.01
23	...	...	0.06	0.06	0.13	1.04
24	...	0.04	0.72	...	0 29	Trace
25	...	0.02	0.17	0.81	...	Trace
26	...	...	0.03	1.40	0.31	0 06
27	0.02	...	Trace	0.41	2.06	0.11
28	0.01	0.07	...	0,20	0.52	...
29	3.25	...	...	0.03	0 26	..
30	Trace	...	...	0.02	Trace	0.33
31	...	...		1.95		...

RAINFALL

at the head of the Waterfall Gardens, Penang, during the first half of 1913.

Rainfall read at 8 a m. and credited to the day in which the twenty-four hours begin.

Day.	January.	February.	March.	April.	May.	June.
1	0.02	...	...	0.03	...	0.23
2	0.03	...	...	1.15	2.90	0.18
3	...	...	0.07	0.18	0.98	0.16
4	1.21	...	0 04	...	1.59	0.05
5	...	...	...	0.19	2.10	0.64
6	...	...	...	...	2.05	0.01
7	...	0.07	...	0.58	0.42	..
8	...	...	...	0.28	0.15	0.03
9	...	...	...	0.18	2.40	2.13
10	0.05	0.42	0.10	0.04	1.54	0.04
11	1.67	...	0.39	0.84	0.34	...
12	0.41	...	0.04	...	...	...
13	0.35	...	0.15	...	2.50	...
14	0.03	...	1.33	...	0.02	...
15	0.10	...	...	...	0.58	...
16	0.50	...	0.32	0.19	1.72	...
17	...	...	0.41	0.17	...	...
18	0.14	...	0.27	0.22	...	0.67
19	...	...	...	...	1.08	...
20	...	...	0.30	...	0.22	1.30
21	...	...	0.09	0.44	0.03	...
22	...	...	1.05	0.17	0.02	0.05
23	...	...	...	...	0.04	...
24	...	...	0.17	0.06	...	0.35
25	...	...	0.23	Trace	...	...
26	...	0.35	0.56	0.36	0.03	...
27	...	...	...	0.02	..	..
28	...	0.10	...	0.07	...	0.11
29	...		...	0.05	...	1.30
30	...		...	0.41	0.10	0.59
31	...		...		0.09	

RAINFALL

at the head of Waterfall Gardens, Penang, during the second half of 1913.

Day.	July.	August.	September.	October.	November.	December.
1	0.03	...	0.03	0.01	1.14	...
2	1.07	...	...	0.50	0.08	0.04
3	...	0.05	0.52	0.09	0.32	0.22
4	0.14	0.05	0.03	0.13	0.16	0 80
5	0.30	0.18	0.22	0.06	0.86	0.03
6	1.85	0.16	0.44	0.02	0.03	0.03
7	0.33	0.80	0.05	1.59	1.27	0.14
8	1.70	0.12	...	0.04	1.96	0.03
9	0.12	0.73	0.42	0.41	0.66	...
10	0.03	...	2.54	2.04	2.74	0.08
11	...	...	0.30	0.47	3.28	0.40
12	...	0.70	2.70	0.60	1.39	0.02
13	...	0.65	4.30	1.34	0.08	0.05
14	0.48	...	1.03	2.24	0.26	0.04
15	0.53	...	2.35	1.75	0.02	0.26
16	0.13	0.09	...	1.76	...	0.92
17	...	0.02	0.12	0.36	1.14	0.22
18	...	0.03	0.04	0.38	0.43	0.03
19	...	0.03	0.02	2.04	0.40	1.60
20	...	0.05	0.08	0.42	0.15	0.02
21	0.26	1.04	4.41	1.67	...	...
22	...	...	3.40	0.08	1.47	0.49
23	0.08	...	0.55	1.03	0.02	0.09
24	...	0.10	3.22	...	...	...
25	0.02	0.39	0.55	...	0.14	0.06
26	...	0.07	1.03	1.50	0.55	0.05
27	0.17	...	...	0.07	0.91	0.08
28	...	0.18	...	1.80	0.20	...
29	...	0.06	0.03	0.01	0.13	...
30	...	..	...	1.60	0.08	0.07
31	0.06	0.08		0.02		0.03

Registered by the

Municipality of George Town.

SUMMARY OF RAINFALL, 1913.

	SINGAPORE (See p. 198).			PENANG			Rain fall in 1911 and 1912, at the head of the Water fall Gardens, Penang.	
	No. of rainy days.	Amount of rain in inches.	Longest Spell without rain.	No. of rainy days.	Amount of rain in inches.	Longest Spell without rain.	1911.	1912.
January - -	not recorded			11	4.51	19	2.19	1.37
February -	partly recorded.			4	0.94		1.47	1.38
March - -	18	18.70	3	16	5.52	5	6.27	3.33
April - -	17	9.99	3	21	5.63	4	9.52	5.57
May - - -	22	9.19	2	22	20.91	3	10.59	17.17
June - - -	25	16.46	1	16	7.84	7	10.10	10.67
July - - -	15	6.50	6	17	7.30	4	3.05	4.56
August - -	14	2.31	5	21	5.58	2	8.98	19.54
September -	20	7.80		24	28.35	2	12.41	17.36
October - -	23	12.51	3	29	24.04	2	12.49	16.65
November -	27	14.64	1	27	19.87	1	9.83	12.46
December -	25	8.25	2	25	5.80	2	4.22	6.87
Total in year	—	—	—	233	136.29	—	91.12	116.93
in 10 months	206	106.35	—	—	—	—	—	—

Greatest amount in 24 hours.	6.62	4.41
„ „ 48 „	10.87	7.81
„ „ 72 „	12.68	8.36

Excessively rainy periods, more than 5.00 having fallen in 72 hours. - - 1 (March)	5 (May, Sept., Oct., Nov.)
No. of days when condition existed - 3 „	13
Periods of Comparative drought, less than 0.02 having fallen in 120 hours - 6 (Feb., Jul, Aug., Sept., Oct.)	6 (Jan., Feb., Mar., Jun.)
No. of days when condition existed - 15	33

A SPADIX IN THE AXIL OF THE SPATHE OF XANTHOSOMA.

In making preparations of the flowers of *Xanthosoma* ? *violaceum*, Schott, for the Singapore herbarium, an interesting abnormality was detected, for in a large spathe two spadixes were found, the position of the second being that of a branch in the axil of the spathe. The spathe in question was 17 inches long; the normally present spadix 12 inches long: but the abnormally produced spadix was only three inches, being too short to pass beyond the constriction of the spathe which had forced it into a curve. Its flowers were younger than those of the normally produced spadix, but apparently normal. On their lesser age rests an argument supporting the view that the abnormally produced spadix is a branch in the axil of the spathe; for if were not of a lower order than the normal spadix its flowers ought to be of the same age.

The abnormal specimen is part of No. 276 now in the Herbarium of the Botanic Gardens.

I. H. BURKILL.

GRAMMATOPHYLLUM FLOWERING IN JANUARY.

In the Agricultural Bulletin of the Straits and Federated Malay States, VI., 1907, page 49, Mr. H. N. Ridley recorded the flowering of *Grammatophyllum speciosum*, Blume, in the Botanic Gardens, in January of that year, the usual flowering in August and September having been omitted in 1906. The same phenomenon has been repeated; for this orchid did not flower in 1913, but flowered in Singapore very freely in January and February, 1914. It was seen to be in flower in the Kukob district of Johore at the same time. In Penang it flowered as usual in July and August, 1913.

I. H. B.

SOME PERTINENT PUBLICATIONS.

THE IMPERIAL BUREAU OF APPLIED ENTOMOLOGY. "In the summer of 1911, when the Prime Ministers of the Self-Governing Dominions were present in England, they were invited by the Secretary of State for the Colonies to discuss with the Entomological Research Committee (appointed by the Colonial Office, in 1909), certain proposal for furthering and co-ordinating the investigation of injurious insects throughout the Empire. By this meeting it was unanimously agreed that the establishment of a central organisation for this purpose was desirable, and consequently a tentative scheme was submitted for the consideration of the Colonial Governments concerned.

At a further conference, held at the Colonial Office, in August, 1912, the matter took more definite shape and it was proposed to form an Imperial Bureau of Entomology, to be supported by contributions from the various Dominions and Colonies, as well as from the British Government. The principal functions of this Bureau were to be to collect and co-ordinate all information bearing upon injurious or useful insects; to organise a system for securing the authoritative identification, with reasonable promptitude, of all insects of economic importance submitted by officials connected with the Departments of Agriculture or Public Health throughout the Empire; to compile gradually a comprehensive card-index to the whole literature of the subject, and to publish monthly the "Review of Applied Entomology," which is intended to give an up-to-date epitome of the current literature." (Preface to the Review, No. 1.)

There has been issued newly a report on the work of the Committee, dated 17th December, 1913, which records great progress towards permanent utility. The Review in two series: Series A, Agricultural, and Series B., Medical and Veterinary—has now appeared for more than a year, the parts of series A. costing ninepence each and the parts of series B. sixpence. The working value in distant centres of this Review is very considerable.

HAMEL SMITH, H., AND PAPE, F.A.G., COCONUTS, THE CONSOLS OF THE EAST. Second edition, London (1914). Tropical Life Publishing Depot., Pp. lxviii and 644 with many illustrations. Price 11 shillings net, post free.

The first 400 pages of the second edition of this work are almost exactly as those of the first edition, but the remaining part of the book is much altered,—slightly by omissions, greatly by additions. Of the added matter the most interesting pages are those where the opinions of several competent authorities are brought together in a discussion of the cost of making copra. This industry to date in various lands is discussed. Recent developments such as the use of explosives in agriculture find a place; Dr. Friederichs coconut-beetle fungus is described. But the part of the book dealing with insect pests should have been made fuller and have been well illustrated.

ZIMMERMANN, A., DER MANIHOT-KAUTSCHUK, SEINE KULTUR, GEWINNUNG AND PRAPARATION, Jena (Gustav Fischer), 1913, pp. 1-342, with 151 figures in the text. Price nine marks, unbound; ten marks, bound. This book gives a very complete account of the rubber-yielding species of Manihot. The author is Director of the Imperial Agricultural Institute of Amani, German East Africa, in which country their cultivation has been taken up more than in any other, and where he has been at work on them for at least ten years.

The figures in the book are originals from the author's photographs or from drawings made for him. The text covers the

whole matter of Ceara rubber—the differences between the species, their rates of growth in all parts of the world, their enemies (chiefly in German East Africa), their tapping, the coagulation of the latex and the return.

On page 154, the author gives his opinion cautiously to the effect that the nutritive rôle of latex cannot be considered as proved; on page 224 he advises that trees should not be tapped until their girth is 40 cm. (nearly 16 inches); on page 33 he shows that in favoured localities this girth is reached in a little over a year, but even 3-4 year old trees should not be tapped oftener than 25-40 times in the year, meagre yields having apparently in the past been due to tapping in excess (page 230); and (page 308) the yield which may be hoped for is:—

in the fourth year,	50	kilogrammes	per hectaire or	44.6	lbs. per acre.
fifth „	100	„	„	89.2	„
sixth „	150	„	„	133.8	„
seventh „	200	„	„	178.4	„
eighth „	200	„	„	178.4	„

He records as actually obtained on the Kwamdoro estate, whose situation seems to be particularly favourable:—

Year.	*Kilos per hectaire.*	*lbs. per acre.*	*Grammes per tree.*	*lbs. per tree.*
4th	60	53.5	100	just under $\frac{1}{4}$ lb.
5th	120	107.6	200	$\frac{2}{5}$ lb.
6th	200	177.8	333	$\frac{7}{10}$ lb.
7th	220	196.1	367	just above $\frac{3}{4}$ lb.

The seed contains nearly 30 per cent. of oil.

KOORDERS, S. H., EXCURSIONSFLORA VON JAVA, UMFASSEND DIE BLUTENPFLANZEN, Jena, Gustav Fischer. Three volumes, pp. xxvi—412; 742; x-498; with figures in the text, 19 plates and 3 maps; 1911-1912. Vol. iv. to be complete in twenty parts, containing reproductions from photographs and line figures of the higher plants of Java, Part 1, 1913.

This work when complete will be the best substitute for a popular Flora of the Malay peninsula that can be recommended, provided that the possessor can read German. Having but little knowledge of botany it will be possible to ascertain the name with considerable ease of any Javanese flowering plant, and of most of the commoner plants of the peninsula. An unfortunately rather long list of corrections has been issued.

MESSRS. C. L. GATIN AND C. M. BRET in a paper in the COMPTES-RENDUS DE L'ACADEMIE DES SCIENCES DE PARIS, clvi. pp. 805-807, point out that all the varieties of *Elaeis guineensis*—the African oil palm—produce on the Ivory Coast (West Africa) two kinds of fruits, the lesser being empty. They say that these lesser sterile deceptive shells are constant in proportion for each variety, being most numerous in var. *ceredia*, so that they appear to be normal to the trees.